Quantifying Emissions

    1. Establishing a Project Baseline

        The proponent should establish a project baseline condition for each source of GHG emissions required to be quantified pursuant to this Policy as outlined above. The following list provides specific guidance for establishing a project baseline in the majority of circumstances. Projects that include categories of emissions other than those discussed herein should look to the MEPA Office for guidance in establishing a baseline for that particular component of the proposed project.

        Building-Related Stationary Source Emissions:

        The baseline for building-related stationary sources (electricity use, heating or cooling from offsite suppliers and on-site fuel consumption) assumes construction of the proposed buildings in compliance with the Massachusetts State Building Code. The proponent should be sure to use the most current version of the Massachusetts State Building Code (780 CMR) that is in effect at the time the ENF is filed. Proponents should also be aware that under the Green Communities Act (Section 55 of Chapter 169 of the Acts of 2008), the Board of Building Regulations and Standards (BBRS) must update the energy provisions of the state building code within one year of any revision to the International Energy Conservation Code (IECC). IECC updates occur every three years, and therefore the State Building Code will be updated at least every three years on a going-forward basis under current law. In order to address this changing baseline, the Secretary's Certificate on the ENF will reference the effective building code version at that particular time, which will be the baseline applicable to the project. This will be the project baseline for the life of the project and shall be the specified baseline for measuring stationary source emissions reductions in the Draft and Final EIRs (even if the State Building Code is updated during the pendency of the project). However, the Secretary may require an updated GHG analysis based upon an updated project baseline (updated State Building Code) if there are significant (multi-year) delays by the proponent in the preparation of the EIR documents. If a proponent is in doubt about the baseline building code applicable to the subject project it should contact the MEPA Office for clarification.

        Process-Related Stationary Source Emissions:

        For projects that will have significant stationary source GHG emissions associated with industrial processes (either direct emissions from fuel consumption or indirect emissions from electricity/energy consumption), distinct from emissions associated with project buildings, the proponent will need to establish a project baseline for the industrial component of the project by estimating the amount of fuel or electricity to be consumed by the specific processes without any mitigation measures (sometimes referred to as the "business as usual" scenario). The intent of this calculation is to estimate emissions from GHG-intensive industrial processes such as power

plants, energy-intensive manufacturing processes, or other industrial processes, in order to provide a better understanding of overall project emissions.

Emissions from Transportation:

The baseline condition for direct transportation-related emissions (emissions associated with operation of fleet vehicles) should be established by the proponent on a case-by-case basis by estimating the project's annual vehicle miles traveled (VMT) by fleet vehicles without imposition of any mitigation measures.

The baseline condition for indirect transportation-related emissions (trips generated on account of the project, discussed in more detail below) should be modeled on the Build Without Mitigation condition developed using the standard methodology outlined in the EEA/MassDOT Guidelines for EIR/EIS Traffic Impact Assessment, as outlined in further detail below.

2. Calculating Projected Baseline Emissions

Building-Related Stationary Source Emissions:

For projects involving construction of buildings, the proponent should use energy modeling software to quantify the energy use associated with a code-compliant building. The model should estimate both direct and indirect emissions. Energy modeling uses computer-based tools to simulate the energy use of a building throughout a year of operation. The following energy modeling software has been previously reviewed and approved for ease of use and usefulness of results for MEPA review: EQUEST, Energy-10, Visual DOE, and DOE2. All of these modeling tools are appropriate for the intended use. However, proponents may use other comparable energy modeling software to achieve the required results, provided that for commercial buildings the software has been approved by the United States Internal Revenue Service (IRS) for use in supporting deductions for costs associated with installation of energy conservation measures commercial buildings. A list of IRS-approved software can be found at: http://www1.eere.energy.gov/buildings/qualified_software.html

The MEPA Office recognizes that the IRS-approved models do not simulate energy use for certain specialized building types. In these cases another model may be used, although advance consultation with the MEPA Office is recommended. In addition, there may be versions of the tools listed by the IRS that are more current than the version listed on the above-referenced website. It is acceptable to use the latest version of IRS-listed software, even if that version is not expressly listed by the IRS.

No model will predict the energy usage of a building with one hundred percent accuracy, as there are many uncontrollable variables. For example, the building may not be built exactly as drawn; the occupants of the building may use the building differently than predicted; or the climate may vary from that which was modeled. The value of the model is its ability to compare alternative mitigation strategies and show the resulting differences in energy use.

The EIR should identify the energy modeling tool and version used for the analysis and include a description of the building size and configuration, occupancy, envelope attributes, operation schedule, and building systems (e.g. HVAC and lighting, etc.). The EIR should identify the input and default values for the parameters listed above used in the energy simulation model for the project baseline to assist in the validation of modeling assumptions and estimated CO_2 reductions. To assist in review, the EIR should either include text file output data that list the input and default modeling parameters generated by the selected modeling software, program generated reports, or tabulation of all the input and default values necessary to verify modeling conclusions.

Once building-related energy consumption has been established through modeling, the results should be converted into GHG emissions. In order to quantify direct emissions, energy modeling software should be used to estimate fuel usage. These should be counted and reported as direct emissions. Once fuel usage is estimated, the proponent can derive the approximate CO_2 emissions by using a reliable data source that contains emission factors for CO_2 based on fuel type. For most fuel types, the Energy Information Administration Emissions Factor and Global Warming Potentials data provides the appropriate factors. This document can be found at http://www.eia.doe.gov/oiaf/1605/emission_factors.html. These emissions factors have been compiled in association with the Voluntary Reporting of Greenhouse Gases Program established by Section 1605(b) of the Energy Policy Act of 1992. For fuel types not covered in this document, the proponent should use another reliable data source in consultation with the MEPA Office.

To quantify indirect emissions, the proponent should then multiply total purchased electricity usage by an emissions factor that calculates the CO_2 emitted through the generation of electricity. The proponent should use the current ISO-New England Marginal Emissions Report, which provides CO_2 emission factors expressed as pounds of CO_2 per megawatt hour for a variety of stationary combustion sources. The ISO-NE Marginal Emissions Report for 2007 is available at: http://www.iso-ne.com/genrtion_resrcs/reports/emission/2007_mea_report.pdf. This report may be updated from time to time and proponents should check whether there is a more recent version at the time they are preparing their analysis. The ISO New England Report provides emissions factors for "average" and "marginal" emissions. The proponent should use the emissions factors for annual **average emissions**. Similar factors for existing district heating, cooling or cogeneration plants that will serve the project should be gathered from the plant operator.[1]

Process-Related Stationary Sources Emissions:

Proponents should follow a similar methodology to that specified above for converting building-related energy consumption into GHG emissions when determining process-related stationary source emissions. In order to quantify direct emissions, the proponent should estimate fuel consumption associated with industrial processes and then derive the approximate CO_2

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[1] Proponents should identify the sources for these emission factors when outlining their total building-related emissions.

emissions by using a reliable data source that contains emission factors for CO_2 based on fuel type. To quantify indirect emissions, the proponent should estimate the amount of electricity to be consumed by the industrial processes and then multiply total purchased electricity usage by an emissions factor that calculates the CO_2 emitted through the generation of electricity. The proponent should use the current ISO-NE Marginal Emissions Report, which provides CO_2 emission factors expressed as pounds of CO_2 per megawatt hour for a variety of stationary combustion sources. Once again the proponent should use the emissions factors for annual **average emissions**. Similar factors for existing district heating, cooling or cogeneration plants that will serve the project should be gathered from the plant operator.

Indirect Emissions from Transportation:

The following steps should be taken to calculate a baseline for indirect transportation-related emissions from most proposed projects:

1. Estimate projected net new trips within the study area identified for the project traffic study or the "mesoscale" analysis (the analysis which is required to identify project-related increases in volatile organic compounds (VOCs) and nitrogen oxides (NOx) and used to demonstrate the consistency of the project with the Massachusetts State Implementation Plan (SIP)). Net new trips should be expressed in daily vehicle miles of travel (VMT) for weekday and weekend conditions. This estimate should be consistent with the trip generation analysis included in the project's traffic study. The analysis should provide a breakdown of customer, employee and truck trips.

2. Calculate annual VMT for the project's net new trips. Calculate VMT for employee, customer and truck trips separately.

$$(260 \times \text{weekday VMT}) + (105 \times \text{weekend-day VMT}) = \text{annual VMT}$$

3. Multiply annual VMT (miles/year) by the appropriate EPA MOBILE 6.2[2] CO_2 emission factor[3] (grams/mile) and divide by 907,185 grams/ton to obtain annual CO_2 emissions (tons/year).

Direct Emissions from Transportation (Fleet Vehicles):

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[2]At the time of publication of this revised policy, MOBILE 6.2 is the appropriate approved model for estimating VMT. It is the understanding of the MEPA Office that U.S. EPA is developing a new model, entitled MOVES, which will allow for enhanced and more accurate CO_2 emissions modeling associated with vehicle trips. Upon approval of the MOVES model by U.S. EPA and MassDEP, it is anticipated that VMT will be estimated using the updated MOVES model in lieu MOBILE 6.2.

[3] MOBILE6.2 provides emission factors by vehicle type, ranging from 368.5 grams/mile for light-duty gasoline vehicles up to 1,633.1 grams/mile for the heaviest diesel trucks. These emission factors can be used for generating detailed trip by vehicle type data. If calculating total vehicle trips for a typical Project, the analysis should use the MOBILE6.2 average emission rate of 550.4 grams/mile, which is based on the most recent fleet mix by type for Massachusetts identified by MassDEP.

The following steps should be taken to calculate a baseline for direct transportation-related emissions from proposed projects that involve the use of fleet vehicles at the proposed project site:

1. Estimate the projected net new trips associated with fleet vehicles owned and operated by the project proponent and associated with the project. The proponent should create realistic assumptions about the vehicle class, number of vehicles, vehicle speeds, and average number and distance of on-site trips for the various fleet vehicles and present them in the analysis.

2. Calculate annual VMT for the project fleet's net new trips. The analysis should clearly state assumptions regarding on-site operations (e.g., fleet vehicles may not operate on weekends, thereby reducing overall annual VMT). Proponents should use their discretion when estimating VMT, but generally should follow the same methodology as used for determining VMT associated with off-site traffic trips:

(260 x weekday VMT) + (105 x weekend-day VMT) = annual VMT

3. Multiply annual VMT (miles/year) by the appropriate EPA MOBILE 6.2 CO_2 emission factor (grams/mile) and divide by 907,185 grams/ton to obtain annual CO_2 emissions (tons/year).[4]

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[4] See footnotes above concerning the use of EPA MOBILE 6.2.